

WEYMOUTH FORE RIVER, MASS.

LETTER

FROM

THE SECRETARY OF THE ARMY

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, UNITED STATES ARMY, DATED MAY 16, 1952, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND AN ILLUSTRATION, ON A REVIEW OF REPORTS ON WEYMOUTH FORE RIVER, MASS., WITH A VIEW TO DETERMINING IF IT IS ADVISABLE TO MODIFY THE EXISTING PROJECT IN ANY WAY AT THIS TIME, REQUESTED BY A RESOLUTION OF THE COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, ADOPTED ON

APRIL 22, 1947



SEPTEMBER 30, 1952.—Referred to the Committee on Public Works and ordered to be printed with one illustration (pursuant to Public Law 504, 82d Cong.)

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WEYMOUTH FORE RIVER, MASS.

LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY,
Washington, D. C., August 22, 1952.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report dated May 16, 1952, from the Chief of Engineers, United States Army, together with accompanying papers and an illustration, on a review of reports on Weymouth Fore River, Mass., with a view to determining if it is advisable to modify the existing project in any way at this time, requested by a resolution of the Committee on Public Works, House of Representatives, adopted on April 22, 1947.

In accordance with section 1 of Public Law 14, Seventy-ninth Congress, the views of the Commonwealth of Massachusetts are set forth in the enclosed communication.

The Bureau of the Budget advises that there is no objection to the submission of the report to Congress. The complete views of the Bureau of the Budget are contained in the attached copy of its letter.

Sincerely yours,

KARL R. BENDETSSEN,
Acting Secretary of the Army.

COMMENTS OF THE BUREAU OF THE BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., August 8, 1952.

The honorable the SECRETARY OF THE ARMY,
(Through the Budget Officer for the Department of the Army.)

MY DEAR MR. SECRETARY: This will acknowledge receipt of your letter dated May 23, 1952, submitting the proposed report of the Chief of Engineers on Weymouth Fore River, Mass., requested by resolution of the Committee on Public Works, House of Representatives, adopted April 22, 1947.

I am authorized by the Director of the Bureau of the Budget to advise you that there would be no objection to the submission of the report to Congress.

Sincerely yours,

CARL H. SCHWARTZ, Jr.,
Chief, Resources and Civil Works Division.

COMMENTS OF THE COMMONWEALTH OF MASSACHUSETTS

THE COMMONWEALTH OF MASSACHUSETTS,
PORT OF BOSTON AUTHORITY,
Commonwealth Pier, No. 5, Boston, May 6, 1952.

Lt. Gen. LEWIS A. PICK,
Chief of Engineers, Department of the Army,
Washington 25, D. C.

DEAR SIR: We regret that our comments on your proposed report covering the review of reports on the Weymouth Fore River project in Massachusetts were inadvertently delayed. We have just received from the Governor's office your letters dated April 1, 1952, and December 18, 1951.

However, we do wish to comment that although dredging to 35 feet below mean low water would have better suited the needs of this area, dredging to 30 feet below mean low water as you propose is a definite improvement over the present condition. Therefore, we are in favor of your proposal.

Very truly yours,

PORT OF BOSTON AUTHORITY,
WALTER A. CORSANO
(For George L. Wey, Chief Engineer).

REPORT OF THE CHIEF OF ENGINEERS, UNITED STATES ARMY

DEPARTMENT OF THE ARMY,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington 25, D. C., May 16, 1952.

Subject: Weymouth Fore River, Mass.
To: The Secretary of the Army.

1. I submit herewith for transmission to Congress the report of the Board of Engineers for Rivers and Harbors in response to resolution of the Committee on Public Works of the House of Representatives, adopted April 22, 1947, requesting the Board to review the reports on Weymouth Fore River, Mass., contained in House Document No. 291, Seventy-seventh Congress, first session, and prior reports, with a view to determining if it is advisable to modify the existing project in any way at this time.

2. After full consideration of the reports secured from the division engineer, and after affording local interests full opportunity to be heard, the Board recommends modification of the existing project for Weymouth Fore River, Mass., to provide for a channel 32 feet deep in rock, 30 feet deep in other material, and 500 feet wide from deep water in Boston Harbor along the southerly half of the Narrows Channel in Nantasket Roads and through Nantasket Gut, thence of the same depths and generally 300 feet wide across Hingham Bay and into Weymouth Fore River to Weymouth Fore River Bridge, following the general alinement of the existing project channel, and extending through and above the bridge to form a maneuvering basin 470 to 650 feet wide, with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of \$3,412,055 for construction in addition to that pres-

ently authorized and \$500 annually for maintenance in addition to that required for the existing project; provided local interests agree to hold and save the United States free from damages due to construction and maintenance of the improvement.

3. After due consideration of these reports, I concur in the views and recommendations of the Board.

LEWIS A. PICK,
Lieutenant General, Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

CORPS OF ENGINEERS, UNITED STATES ARMY,
BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington D. C., October 30, 1951.

Subject: Weymouth Fore River, Mass.

To: The Chief of Engineers, United States Army.

1. This report is submitted in response to the following resolution adopted April 22, 1947:

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on Weymouth Fore River, Massachusetts, contained in House Document Numbered 291, Seventy-seventh Congress, first session, and prior reports, with a view to determining if it is advisable to modify the existing project in any way at this time.

2. Weymouth Fore River rises in Braintree, Mass., and flows northward 7.5 miles to empty into Hingham Bay on the south side of Boston Harbor. It is navigable and tidal to an old dam at East Braintree, 6.2 miles above the mouth. The mean tidal range is 9.5 feet. Entrance to Weymouth Fore River is possible either through West Gut between Nut and Peddocks Islands or through Nantasket Gut between Peddocks Island and the mainland. The existing Federal project for improvement of Weymouth Fore River provides for a channel 27 feet deep and 300 feet wide from a point in Hingham Bay between Nut and Peddocks Islands, 4.1 miles to Weymouth Fore River Bridge at Quincy; a channel 27 feet deep and 400 to 300 feet wide from Nantasket Roads through Nantasket Gut and Hingham Bay 1.8 miles to deep water in Weymouth Fore River west of Sheep Island; and extension of the 27-foot channel so as to include the 27-foot State-improved channel through and above the Weymouth Fore River Bridge to provide a combined channel and maneuvering basin 27 feet deep, 470 to 900 feet wide, and 2,500 feet long. The channel from Hingham Bay between Nut and Peddocks Islands to Weymouth Fore River Bridge has been completed, and the portion above the bridge has been partially completed by the Commonwealth of Massachusetts and the Department of the Navy. No work has been performed on the channel through Nantasket Gut which now has a controlling depth of 21 feet. Costs to the United States for the existing project to June 30, 1949, were \$355,227 for new work and \$84,817 for maintenance. The Commonwealth of Massachusetts and other local interests have undertaken channel-improvement work in Weymouth Fore River largely as required local cooperation in connection with the various Federal projects. As required local

cooperation under the existing project, the Commonwealth of Massachusetts expended \$69,013 for dredging a channel 27 feet deep through and above the Weymouth Fore River Bridge. In addition, private interests have expended considerable sums in dredging launching and maneuvering areas in the main portion of the river in the vicinity of their terminals. Town River, a small estuary, enters Weymouth Fore River a short distance below the bridge. It has been improved by the United States to provide a channel 24 feet deep for a distance of 6,700 feet with a turning basin 18 feet deep at the upper end, and thence a channel 15 feet deep for a distance of 1,370 feet. Weymouth Back River, a small estuary 4.5 miles long which empties into Hingham Bay at the mouth of Weymouth Fore River, has been improved by the United States to a depth of 15 feet.

3. Hingham Bay and the adjoining towns of Quincy, Hingham, Weymouth, Braintree, and Hull, with a combined population of about 126,000 in 1940, are in the Boston industrial area. Along the banks of Weymouth Fore River are large industrial plants devoted to shipbuilding, development of electrical energy, distribution of coal and petroleum products, manufacture of soap, and similar activities. Most of these plants are equipped to utilize water transportation, and space is available for expansion of present facilities. Rail and highway facilities serve the region. Water-borne commerce handled at the Weymouth Fore River terminals, consisting principally of coal and petroleum products, amounted to 1,813,200 tons in 1948 and averaged 1,565,700 tons during the 10-year period 1939 through 1948. The 1948 tonnage was transported in 1,122 round trips by vessels which included 107 in-bound and 43 out-bound craft with drafts between 20 and 31 feet. Commerce handled at terminals located on the tributary Town River and the nearby Weymouth Back River during the same 10-year period averaged 468,000 tons, practically all of which moved through some part of the existing project for Weymouth Fore River.

4. Local interests request modification of the existing project to provide for a channel 35 feet deep and 350 to 400 feet wide from deep water in Boston Harbor through Nantasket Gut to terminals above the Weymouth Fore River Bridge. The American Merchant Marine Institute desires, if a depth of 35 feet cannot be justified, that 30 feet be considered as the absolute minimum. In justification, it points out that the existing channel is inadequate to accommodate modern deep-draft vessels, including the T-class tankers except for short periods during high-water slack in daylight hours. Other interests state that larger tankers of the 28,000-ton type which might be placed in service to Weymouth Fore River in the future would add to the hazards of operating in the present channel. Several recent occurrences of vessel groundings are cited. A representative of the Bethlehem Steel Co. shipyard, located on Weymouth Fore River, points out the necessity for improvement to permit movement of large naval craft to the company's yard without having to wait for high tide. The Chief of Naval Operations, United States Navy, states that the shipyard has no drydock and vessels would not be sent there for repair of underwater damage; the present channel was satisfactory for passage of the large battleship *Massachusetts* and large aircraft carriers during World War II, and if future naval construction should be such as to require a deeper channel the time necessary for vessel construction

would be sufficient to permit any dredging well in advance of the launching date. He considers the presently authorized depth of 27 feet satisfactory for the Navy's peacetime needs. Local interests offer to meet the required condition of local cooperation.

5. The division engineer, after consideration of various channel depths and widths, finds that the most suitable plan of improvement consists of modification of the existing project to provide a channel 37 feet deep in rock and 35 feet deep in other material, 500 feet wide from deep water in Boston Harbor along the southerly half of the Narrows Channel in Nantasket Roads, thence turning and passing through Nantasket Gut, thence of the same depths and generally 300 feet wide across Hingham Bay and into Weymouth Fore River to and through the Fore River Bridge following the general alinement of the existing project channel, and thence deepening part of the existing maneuvering basin above the bridge to 37 feet in rock and 35 feet in other material, the improved area varying in width from 470 to 650 feet. The division engineer points out that a depth of 37 feet in rock and 35 feet in other material, as proposed, would permit navigation without delay due to tidal conditions and that provision of a channel wider than 300 feet to avoid the remote likelihood of 28,000-ton tankers having to wait in order to pass other large vessels is not warranted. He estimates the Federal cost for further improvement in accordance with the plan outlined at \$8,829,200 for construction and \$500 for annual maintenance, in addition to that required for work presently authorized, and the non-Federal first cost at \$235,680 for alterations to utilities and bridge control cables. The division engineer bases his economic justification upon average annual prospective commerce of 3,017,000 tons during the life of the improvement, assuming the use of 28,000-ton tankers for carrying 51 percent of the commerce, and starting with the present condition of the channel. He evaluates the annual benefits from the proposed improvement at \$638,400 from elimination of delays due to waiting for high water and daylight; from the reduction in the number of accidents; and from the savings in lightering charges, reshipment charges, tug hire, and vessel transit time through the more direct Nantasket Gut Channel. Annual charges estimated on the same basis amount to \$387,829. The benefit-cost ratio is 1.6. The division engineer recommends modification of the existing project for Weymouth Fore River, Mass., to provide for further improvement in accordance with his described plan, subject to the condition that local interests hold and save the United States free from all damages due to the construction and the improvement.

6. The Board of Engineers for Rivers and Harbors was not convinced of the advisability of further improvement beyond completion of the authorized 27-foot project and so notified local interests. At their request a hearing was held by the Board at which port, shipping, and industrial interests spoke in favor of the proposed improvement. The need was stressed for a depth of 35 feet at mean low water to provide for the uninterrupted and safe navigation of both the T-type and 28,000-ton tankers. It was further pointed out that the present trend is toward construction and use of the larger tankers, including those of 28,000 tons, and that the improvement should be adequate to permit use of such vessels.

VIEWS AND RECOMMENDATIONS OF THE BOARD OF ENGINEERS FOR
RIVERS AND HARBORS

7. After careful consideration of the division engineer's report and additional information submitted to the Board by local interests, the Board finds that further improvement of Weymouth Fore River is needed to more adequately provide for navigation of modern, deep-draft vessels. The Board concurs with the reporting officer that a channel width of 500 feet is required in the exposed area from deep water to and through Nantasket Gut and that a width of 300 feet, in general, is adequate upstream of Nantasket Gut when such factors as exposure, intensity of prospective vessel traffic, and use of tugs, are taken into account. However, the Board is of the opinion that, in determining the economic justification for further improvement, it should be assumed that the authorized 27-foot depth is completed, and comparison of additional benefits and costs should be made for improvement beyond that depth. Such additional benefits would accrue through reduction of delays due to lack of depth, elimination of reshipment charges, and elimination of the need for lightering of the 28,000-ton tankers. Because of the economies to be realized, it is reasonable to assume that 28,000-ton tankers will carry part of the petroleum commerce. An analysis of costs and benefits for deepening to various depths below 27 feet indicates that deepening to 30 feet (32 feet in rock) is well justified, but that the additional benefits from deepening from 30 to 32 feet or to 35 feet are not sufficient to justify the additional expenditures required. Although a 30-foot channel would still require some waiting for tide by the T-class and the 28,000-ton tankers, having drafts of about 30 and 33 feet, respectively, the benefits to be obtained from complete elimination of such delays do not justify the additional cost of providing greater depths at this time.

8. Accordingly, the Board recommends modification of the existing project for Weymouth Fore River, Mass., to provide for a channel 32 feet deep in rock, 30 feet deep in other material, and 500 feet wide, from deep water in Boston Harbor along the southerly half of the Narrows Channel in Nantasket Roads and through Nantasket Gut, thence of the same depths and generally 300 feet wide across Hingham Bay and into Weymouth Fore River to Weymouth Fore River bridge, following the general alinement of the existing project channel, and extending through and above the bridge to form a maneuvering basin 470 to 650 feet wide, with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of \$3,412,055 for construction in addition to that presently authorized and \$500 annually for maintenance in addition to that required for the existing project; provided local interests agree to hold and save the United States free from damages due to construction and maintenance of the improvement.

For the Board:

G. J. NOLD,
Major General, Chairman.

REPORT OF THE DIVISION ENGINEER

SYLLABUS

The division engineer finds that prospective benefits are sufficient to warrant the modification of the existing project in Weymouth Fore River. He, therefore, recommends a channel, 35 feet deep at mean low water, generally 500 feet wide from deep water abreast of Boston Light to and through Nantasket Gut, thence generally 300 feet wide to Fore River Bridge and continuing for about 2,700 feet above the bridge for widths varying from 470 to 650 feet to form a maneuvering basin substantially as shown on the maps accompanying this report, at an estimated cost of \$8,829,200 for new work, in addition to the cost of the authorized project, with annual maintenance of \$500 in addition to that now required, subject to certain conditions of local cooperation.

DEPARTMENT OF THE ARMY,
CORPS OF ENGINEERS, NEW ENGLAND DIVISION,
Boston 10, Mass., January 25, 1950.

Subject: Survey (Review of Reports) of Weymouth Fore River, Mass.

To: The Chief of Engineers, United States Army, Washington 25, D. C.

AUTHORITY

1. This report is submitted in compliance with the following resolution adopted April 22, 1947, by the Committee on Public Works of the House of Representatives, United States Congress:

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on Weymouth Fore River, Massachusetts, contained in House Document Numbered 291, Seventy-seventh Congress, first session, and prior reports, with a view to determining if it is advisable to modify the existing project in any way at this time.

2. The preliminary examination was assigned by the Chief of Engineers May 15, 1947, but in view of a report of survey scope authorized for a tributary waterway, Town River, the study for Weymouth Fore River was changed to one of survey scope by the Chief of Engineers on July 16, 1947.

REPORTS UNDER REVIEW

3. The report contained in House Document No. 291, Seventy-seventh Congress, first session, was on a survey (review of reports) of Weymouth Fore River, Mass. It considered the modification of the existing project to include the 27-foot State-improved channel, through and above the Weymouth Fore River Bridge and to further improve the section of this channel above the bridge by enlarging the present channel to provide a combined channel and maneuvering basin of the same depth, with a length of about 2,500 feet and widths varying from 470 to 900 feet. The Chief of Engineers recommended the improvement and the project was adopted by Congress by the River and Harbor Act of March 2, 1945.

4. Two earlier reports are also pertinent to the review. One of these reports contained in House Document No. 568, Seventy-sixth Congress, third session, considered a channel in Nantasket Gut, 27 feet deep and 400 feet wide, extending from deep water in Nantasket Roads to Hingham Bay, a distance of about 2,000 feet; thence through Hingham Bay, 27 feet deep and 300 feet wide, for a distance of about

1.4 miles to deep water in Weymouth Fore River west of Sheep Island. The Chief of Engineers recommended the improvement and the project was adopted by Congress by the River and Harbor Act of October 17, 1940. The other report, contained in House Document No. 207, Seventy-second Congress, first session, dealt with a channel 27 feet deep and 300 feet wide, extending through West Gut, between Nut and Peddocks Islands, thence through Hingham Bay to Weymouth Fore River Bridge. The Chief of Engineers recommended the improvement and the project was adopted by Congress by the River and Harbor Act of August 30, 1935. The channel as described in the last-mentioned document is the basis of the project as now maintained.

DESCRIPTION

5. Weymouth Fore River rises in Braintree, Mass., and flows in a northerly direction 7.5 miles, emptying into Hingham Bay on the south side of Boston Harbor. Its drainage area is small and no records of discharge are available. The head of navigation is an old dam at East Braintree, 6.2 miles above the mouth. Below this dam the river is tidal. There are two approaches to the 27-foot river channel from Boston Harbor which are briefly described as follows:

(a) From open sea abreast of Boston Lightship, thence northerly of Graves Light, thence through the 40-foot North Channel and into President Roads, usually for anchorage or pratique, thence through the 27-foot Narrows Channel to a point westerly of Kelly Rock where the route turns sharply into Nantasket Roads, thence northerly and westerly of Peddocks Island and into West Gut and Hingham Bay and on into Weymouth Fore River. This route, improved to 27 feet or deeper, is the one most often used especially in bad weather and under unfavorable tidal conditions.

(b) From open sea abreast of Boston Lightship, northerly of Thieves Ledge, southerly of Boston Light and northerly of Hunt Ledge into Nantasket Roads, having a controlling depth of about 29 feet, thence following the same route as described in (a) above. This route is used in fair weather and under favorable tidal conditions.

(c) Same as described in (a) and (b) above except that the entrance into Weymouth Fore River is through Nantasket Roads and Nantasket (Hull) Gut into Hingham Bay and southwesterly across said bay to a point westerly of Sheep Island. This route has a controlling depth of 21 feet, and although an improvement has been authorized for a depth of 27 feet, no work has as yet been undertaken. This route through Nantasket Gut is now used by light-draft vessels, and shipping interests are desirous of having this route improved to accommodate ships of deep draft. The available depth in the upper reaches of the river to East Braintree is about 6 feet at mean low water. The principal anchorages for vessels using Weymouth Fore River are in Nantasket Roads and the deep water area in Hingham Bay just south of Nantasket Gut.

6. Town River, a small tidal tributary, enters Weymouth Fore River at Quincy Point about 1,500 feet below the Weymouth Fore River Bridge. This stream is about 2 miles in length and lies entirely within the limits of the city of Quincy, Mass. It has been improved to provide a channel 150 feet wide and 24 feet deep at mean low water for a distance of 6,700 feet from the mouth, thence 100 feet wide and 15

feet deep for an additional distance of 1,370 feet to the head of navigation. On the north side of the 24-foot channel, at its head, a basin of about 10 acres in area with a depth of 18 feet at mean low water has been provided for the turning of vessels.

7. The mean range of tide is 9.5 feet and the spring range is 11.0 feet. The locality is shown on United States Coast and Geodetic Survey Charts Nos. 246 and 1207, and on the maps accompanying this report.

TRIBUTARY AREA

8. The area tributary to Weymouth Fore River contains the city of Quincy and several small towns, the most important of which are Weymouth, Braintree, Hingham, and Hull. However, commodities brought in by the deep-draft vessels are distributed throughout Metropolitan Boston and adjacent localities dependent on the distribution pattern of the individual firm and its pertinent product. Quincy and Weymouth lie on the west and east banks of the river, respectively, and Braintree is at the head of navigation. In 1947, the population of Quincy was estimated to be 85,384. The combined population of the towns mentioned was 50,416 in 1940. The combined value of real estate as of January 1, 1949, was \$254,579,893. About 7 miles to the northwest is the city of Boston with a population in 1940 of 770,816.

9. The principal industries in the tributary area, those utilizing the river and adjoining waterways to the limit of their navigable capacity are shipbuilding, oil storage and distribution, generation of electric power, and the manufacture of soap products. Other industries in the tributary area which do not presently utilize the waterways include quarrying and finishing of granite, the manufacture of machinery and iron and steel products, and many small businesses furnishing supplies and services to the residential sections of the territory.

10. The locality is served by an excellent system of improved roads and highways which connect with the water front. The nearest railroad is that of the New York, New Haven & Hartford, with stations at Quincy about 2 miles to the westward and at Braintree at the head of navigation, about 2 miles above the upper end of the present 27-foot project. The only connections between rail and water are those of the City Fuel Co., the Cities Service Oil Co., and the Bethlehem Steel Co., which facilities are not open to public use.

BRIDGES

11. Weymouth Fore River is crossed by one bridge between its mouth and the upper limits of the desired improvement. This bridge, commonly known as Weymouth Fore River Bridge, is a State-owned highway structure connecting Quincy with North Weymouth, and is a drawbridge of the double-leaf bascule type. It was constructed under plans approved by the War Department and was completed July 25, 1936. The drawspan has a horizontal clearance of 175 feet and vertical clearances, in the closed position, of 43.2 and 33.7 feet at mean low water and mean high water, respectively. For a width of 100 feet in the middle of the drawspan, the least vertical clearance is 49.5 feet at mean low water and 40.0 feet at mean high water. The top of the wood piling which supports the piers of the drawspan is at elevation

33.0 feet below mean low water. The control cables for the bridge are laid on the bottom across the draw passage downstream of the bridge.

UNDERWATER UTILITIES

12. The navigable waters of Weymouth Fore River and adjacent waters used by vessels approaching Weymouth Fore River are crossed by numerous underwater utility lines. Those lines that cross Nantasket Roads, Nantasket Gut, and the Narrows Channel, serve commercial purposes, harbor-defense installations, and Coast Guard installations. Those lines that lie in the inner waters are commercially used. The utility lines are described below:

(a) Cable between Allerton and Boston Light, depth about 30 feet below mean low water.

(b) Cable between Allerton and Lovell Island, depth about 50 feet below mean low water. Abandoned.

(c) Cables and pipeline between Windmill Point and Georges Island, depth about 40 feet below mean low water.

(d) Cable between Windmill Point and Gallups Island, passing through Hull Gut, depth about 30 feet below mean low water.

(e) Cable from south side of Hull passing through Hull Gut to Georges Island, depth at site of proposed channel about 30 feet below mean low water.

(f) Cables between Hull and Peddocks Island crossing Hull Gut, depth at site of proposed channel about 30 feet below mean low water.

(g) Cables crossing the Narrows Channel from Georges Island to Lovell Island, depth about 27 feet below mean low water.

(h) Pipeline from Gallups Island to Lovell Island, crossing the Narrows Channel, depth about 27 feet below mean low water.

(i) Pipeline from Nut Island to Peddocks Island, crossing West Gut, depth about 30 feet below mean low water.

(j) Three sewer lines extending northerly from Nut Island, passing westerly of Peddocks Island, minimum depth in existing channel about 25 feet below mean low water.

(k) Sewer line, 48 inches in diameter, extending from Rock Island Cove to North Weymouth, depth at site of proposed channel 37 feet below mean low water. Owned by Metropolitan District Commission.

(l) Three telephone cables 120 feet north of Weymouth Fore River Bridge, depth at site of proposed channel about 30 feet below mean low water. Owned by New England Telephone & Telegraph Co.

(m) Four bridge operating cables just north of Weymouth Fore River Bridge, depth at site of proposed channel about 30 feet below mean low water. Owned by Commonwealth of Massachusetts, Department of Public Works.

PRIOR REPORTS

13. The following tabulation lists the essential features of the reports on Weymouth Fore River previously submitted:

Table of prior reports

Authority	Type of report	Document No.	Improvement considered	Recommendation	Action by Congress
River and Harbor Act, Aug. 11, 1888	Preliminary examination and survey.	H. Ex. Doc. No. 26, 51st Cong., 1st sess.	Channel 6 feet deep, with widths of 50, 80 and 100 feet, extending from Mill Cove to the head of navigation.	Favorable.....	Adopted by River and Harbor Act, Sept. 19, 1890.
River and Harbor Act, June 13, 1902	.....do.....	H. Doc. No. 36, 58th Cong., 2d sess.	Channel 300 feet wide and 18 feet deep, extending from Weymouth Fore River Bridge downstream about 1 mile.	.....do.....	Adopted by River and Harbor Act, Mar. 3, 1905.
River and Harbor Act, June 25, 1910	.....do.....	H. Doc. No. 1334, 61st Cong., 3d sess.	Widening of the 18-foot channel previously provided, and the removal of ledge rock.	.....do.....	Adopted by River and Harbor Act, Feb. 27, 1911.
River and Harbor Act, Mar. 4, 1913	.....do.....	H. Doc. No. 803, 63d Cong., 2d sess.	Widening the 18-foot channel below Weymouth Fore River Bridge to 400 feet with estimates for alternate depths of 20, 21, 22, and 24 feet.	Recommended widening of channel to 400 feet without change in project depth.	None.
Resolution of Committee on Commerce, U. S. Senate, June 27, 1914.	.....do.....	Senate Committee Doc. No. 13, 63d Cong., 3d sess.	Channel 300 feet wide and 24-foot depth in Nantasket Roads to Weymouth Fore River Bridge.	Favorable.....	Adopted by River and Harbor Act, July 27, 1916.
River and Harbor Act, Mar. 3, 1925	Survey.....	Not printed.....	Study of channels 26, 28, and 30 feet deep, extending from Nantasket Roads to a point 2,500 feet above Weymouth Fore River Bridge.	Unfavorable.....	None.
River and Harbor Act, July 3, 1930	Preliminary examination and survey.	H. Doc. No. 207, 72d Cong., 1st sess.	Channel 27 feet deep and 300 feet wide, extending from Hingham Bay to Weymouth Fore River Bridge.	Favorable.....	Adopted by River and Harbor Act, Aug. 30, 1935. (Basis for existing project).
River and Harbor Act, Aug. 26, 1937, and resolution of Committee on Rivers and Harbors, House of Representatives, Feb. 8, 1938.	Survey.....	H. Doc. No. 568, 76th Cong., 3d sess.	Approach channel to Weymouth Fore River through Nantasket Gut and Hingham Bay, 27 feet deep with widths of 400 and 300 feet.	.....do.....	Adopted by River and Harbor Act, Oct. 17, 1940.
Resolution of Committee on Rivers and Harbors, House of Representatives, Apr. 4, 1939.	.....do.....	H. Doc. No. 291, 77th Cong., 1st sess.	Inclusion of 27-foot State Channel through and above Weymouth Fore River Bridge and a combined channel and maneuvering basin 27 feet deep.	.....do.....	Adopted by River and Harbor Act, Mar. 2, 1945.

EXISTING CORPS OF ENGINEERS PROJECT

14. The original project for Weymouth Fore River was adopted by the River and Harbor Act of September 19, 1890, and was for improvement of the channel above the Weymouth Fore River (Quincy Point) Bridge. Under this project, dredging was done in a channel 7,000 feet long, 6 feet deep at mean low water, 100 feet wide in the lower 4,400 feet, 80 feet wide in the next 1,650 feet to Braintree Bridge, and 50 feet wide in the remaining 950 feet above this bridge. Except for four small ledges uncovered during dredging, the project was completed to full dimensions in the fiscal year 1906 at a cost of \$42,750, of which \$2,750 was for maintenance.

15. A project for improving the river below Weymouth Fore River Bridge was adopted by the River and Harbor Act of March 3, 1905, and extended by the acts of February 27, 1911, and July 27, 1916. The improvements under this project were the excavation of a channel 300 feet wide and 18 feet deep at mean low water from Hingham Bay to the Weymouth Fore River Bridge; the widening and straightening of this channel by dredging and the removal of ledge; and its deepening to 24 feet at mean low water, 300 feet wide, with a maximum width of 600 feet at the bend below Channel Rock. All work under this project was completed in 1927.

16. The expenditures for all improvements prior to the adoption of the existing project were \$635,900 for new work and \$5,250 for maintenance, a total of \$641,150, exclusive of \$100,000 expended from contributed funds.

17. The existing project, adopted by the River and Harbor Act of August 30, 1935 (H. Doc. 207, 72d Cong., 1st sess.) and supplemented by the River and Harbor Acts of October 17, 1940, and March 2, 1945 (H. Doc. 568, 76th Cong., 3d sess., and H. Doc. 291, 77th Cong., 1st sess.) provides for:

(a) A channel 27 feet deep, with a general width of 300 feet from a point in Hingham Bay between Nut and Peddocks Islands to the Weymouth Fore River Bridge.

(b) A channel in Nantasket Gut, 27 feet deep and 400 feet wide, extending from deep water in Nantasket Roads to Hingham Bay; thence through Hingham Bay, 27 feet deep and 300 feet wide for distance of 1.4 miles, to deep water in Weymouth Fore River west of Sheep Island.

(c) Extension of the 27-foot channel so as to include the present 27-foot State-improved channel through and above the Weymouth Fore River Bridge, providing a combined channel and maneuvering basin of the same depth, with a length of about 2,500 feet and widths varying from 470 to 900 feet.

18. The prescribed channel under paragraph 17 (a) above, has been improved to project dimensions and the portion above the Weymouth Fore River Bridge described under paragraph 17 (c) above, has been partially completed by the Commonwealth of Massachusetts and the Department of the Navy. To provide full project widths and depths requires considerable additional dredging to be done. No work has been done on the channel through Nantasket Gut described under paragraph 17 (b) above. Costs and expenditures through June 30, 1949, under the existing project have been \$355,227.34 for new work and \$84,817.27 for maintenance. The latest (1945) approved estimate

of annual maintenance is \$6,000. This estimate is considered inadequate in light of present dredging prices and the fact that since the channel was completed late in 1937, the costs of maintenance have been \$84,817 or about \$7,500 a year for the part of the project on which construction has been completed. In addition it is estimated that the annual maintenance cost of dredging the incompleted part above the highway bridge is \$1,000, for the incompleted Nantasket Gut Channel \$3,000, and annual maintenance cost of aids to navigation \$3,000. Thus it is estimated that the annual maintenance cost should be \$14,500.

LOCAL COOPERATION ON EXISTING AND PRIOR PROJECTS

19. The River and Harbor Act of March 3, 1905, which authorized the 18-foot channel below Weymouth Fore River Bridge provided that the portion of the river above this bridge should thereafter be maintained by the Commonwealth of Massachusetts, or other agency, without expense to the United States. To meet this requirement, the Commonwealth has maintained a channel about 5,000 feet long, 50 to 75 feet wide, and 6 feet deep at mean low water, extending to a point about 400 feet above Braintree Bridge. This channel was last dredged in 1928. The total cost has been \$50,540.72. In addition, an area 700 feet long and 100 feet wide on the east side of the channel just above Weymouth Fore River Bridge was dredged to a depth of 18 feet at mean low water. This work was done in 1915 and 1916, at a cost to the Commonwealth of \$7,847.15.

20. The project adopted by the River and Harbor Act of July 27, 1916, which provided for the 24-foot channel below the Weymouth Fore River Bridge, was authorized on the condition that local interests contribute \$100,000 toward the cost of the work. To comply with this condition, the Commonwealth of Massachusetts contributed \$75,000, the Bethlehem Steel Co. \$15,000, and the city of Quincy \$10,000.

21. The project adopted by the River and Harbor Act of August 30, 1935, provided that local interests shall dredge and maintain a channel of 27-foot depth and suitable width extending for at least 2,500 feet through and upstream of the Weymouth Fore River Bridge. This condition of local cooperation was fully complied with by the Commonwealth of Massachusetts, at a cost of \$69,012.90.

22. Total expenditures under prescribed conditions of local cooperation, including contributed funds, have been \$228,883.65, of which \$1,482.88 was for surveys.

OTHER IMPROVEMENTS

23. In 1903 and 1904, the Commonwealth of Massachusetts dredged a channel 15 feet deep and 100 feet wide at mean low water, extending for 2,000 feet downstream from the Weymouth Fore River Bridge. This work was done at a cost of \$10,235.87. The Bethlehem Steel Co. has, at various times, dredged its launching basins and areas in the main portion of the river to depths varying from 27 to 30 feet at mean low water. This work has been done at a cost to the company, to date, of approximately \$510,000. The Cities Service Oil Co. has improved its docking facilities for large tankers by dredging a berth

600 feet long and 90 feet wide, with a depth of 31 feet, a maneuvering area to 24 feet, and an area adjacent to the deep berth to 15 feet for the accommodation of towboats that assist in the docking operations. The expenditure by the company for this dredging was about \$250,000. Other improvements of lesser importance have consisted of the dredging by various private interests of berths and basins with dimensions commensurate with their needs.

TERMINAL AND TRANSFER FACILITIES

24. The chief terminal facilities on the south shore of Boston Harbor are on Weymouth Fore and Town Rivers, which unite at Quincy Point about 1,500 feet below the Weymouth Fore River Bridge. The most important of these facilities are briefly described as follows:

(a) The Bethlehem Steel Co., shipbuilding division, above Weymouth Fore River Bridge, maintains one of the largest and most complete shipbuilding and ship repairing plants on the Atlantic coast. It is equipped with 12 launching ways and 3 mooring basins. The mooring basins vary in depths from 30 to 40 feet at mean low water, and the largest is about 785 feet long and 350 feet wide. Four piers are available for use in outfitting and repairing vessels. Crane equipment includes two 150-ton overhead traveling cranes having a total lift capacity in excess of 350 tons, and an electric hammerhead crane having a capacity of 120 tons at 60-foot radius and 26 tons at 97-foot as well as numerous other cranes of smaller lift capacity. Mechanical handling facilities, shipbuilding ways, and other auxiliary features of this plant are adequate for building some of the largest ships. Railroad tracks of the New York, New Haven & Hartford Railroad connect directly with local tracks in the yard. The facilities of this plant are used exclusively by the shipbuilding company.

(b) The Cities Service Oil Co. maintains a wharf just above the Bethlehem Steel Co. which is used for the receipt and shipment of petroleum products. This wharf has a tanker pier which consists of three circular caissons of sheet steel piling filled solid, and an open-pile timber deck approach trestle connecting the middle caisson with shore. The barge pier is of open-pile, timber-deck construction. The tanker pier affords a berth 600 feet long with a depth of 31 feet at mean low water. The barge pier affords a berthing space 215 feet long with a depth of 15 feet at mean low water. Four 12-inch, one 10-inch, two 8-inch, and four 6-inch pipelines on the wharf extend to 27 steel storage tanks with total capacity of 928,000 barrels. Railway connections and good roads afford direct access to the plant. The wharf is not open to public use.

(c) The Boston Edison Co., a public utility producing electric power for its 400,000 customers, maintains a coal wharf on the east bank of the river just above and below Weymouth Fore River Bridge. The wharf consists of timber and concrete bulkheads with solid fill, and an open-pile extension. The vessel berth is 600 feet long with a depth of 30 feet at mean low water. There is an open storage space for 100,000 tons of coal, and a supply of 50,000 tons is normally on hand. During 1949 the generating capacity of the plant was greatly increased and the plant was converted from coal burning to oil burning. Mechanical handling facilities consist of two electric traveling tower cranes with a capacity of 200 tons per hour, and one electric traveling bridge crane

with a capacity of 400 tons per hour. Two large oil-storage tanks have been erected which have a combined capacity of 9,300,000 gallons or about 230,000 barrels. There are no railway connections to this property. Excellent roads, however, connect with the plant. The wharf is not open to public use.

(d) The Procter & Gamble Manufacturing Co. is located on the west bank of the river just below the Weymouth Fore River Bridge. The company maintains a wharf of open-pile, timber-deck construction, with dimensions as follows: Face, 150 feet; lower side, 51 feet; and upper side, 51 feet. The wharf is used for the receipt of vegetable oil. The depth at mean low water on the face, lower and upper sides, is 30 feet. There are 462 feet of available berthing space with dolphins. There is a surface railroad track in the rear of the wharf and excellent highway facilities are available. Two 4-inch pipelines are on the wharf for receipt of vegetable oil.

(e) The City Fuel Co. on the west side of the river just above Weymouth Fore River Bridge receives coal by water for distribution to retail trade. The wharf is 185 feet long and consists of a stone bulkhead, with open-pile extension, constructed along the shore. The depth alongside is about 9 feet at mean low water. Mechanical handling facilities consist of one 1-ton steam-operated traveling tower crane, 45-foot reach, and trestles and dump cars. A surface track connecting with the New York, New Haven & Hartford Railroad is located in the rear of the wharf. Good highway connections are also available.

25. In addition to the above, there are several facilities of minor importance located on or near the upper limit of Weymouth Fore River. These facilities consist of small wharves which are owned by retail coal and lumber dealers, and marine equipment designed for the handling of small boats. The existing terminal facilities are considered adequate for present and prospective traffic. Expansion of business activity in the area could be accomplished either by a more intensive use of the existing facilities or by the construction of additional terminals for which adequate space is available.

IMPROVEMENT DESIRED

26. In order to afford local interests an opportunity to express their views relative to the improvement of Weymouth Fore River, a public hearing was held at the Council Chamber, City Hall, Quincy, Mass., on June 27, 1947. The hearing was well attended. There were present at the hearing representatives of the Commonwealth of Massachusetts, the Maritime Association of the Boston Chamber of Commerce, the American Merchant Marine Institute, the Quincy Chamber of Commerce, the Propeller Club of the United States, the local municipal governments, shipping interests, the yacht clubs and business interests located on Weymouth Fore River and Town River.

27. The improvement desired consists of deepening the present Fore River Channel from 27 feet to 30 or 35 feet at mean low water, whichever depth is found to be justified; the widening of the channel from 300 feet to 350 or 400 feet with suitable increases on the bends; and the extension of the channel from in front of the launching ways of the Bethlehem Steel Co. above the Weymouth Fore River Bridge out to open water through Nantasket Gut.

28. The principal arguments advanced by proponents of the improvement were concerned with the movement of large deep-draft vessels. The representative of the Bethlehem Steel Co. stressed the necessity of having a deeper and wider channel to permit freedom of movement of large combat ships between the Navy yards at Boston and the company's yard at Quincy. He stated that it was impossible to navigate the larger combat ships, cruisers, battleships, or carriers with normal displacement and crew all aboard into the company's yard without waiting for favorable tide. He claimed the improvement was needed to continue the shipbuilding industry and its trend.

29. The representative of the American Merchant Marine Institute presented data concerning available tankers and discussed at some length the economies of transporting bulk cargoes in deep-draft vessels. He stated that the accepted trend in oil transportation is toward the use of ships of the T-2 tanker class and that ships larger than T-2's are now under construction. General cargo ships now being used are of the C class, while the colliers are Liberty and Victory classes. The full-time operation for some of these classes require more than a 30-foot channel. The institute's representative estimated that the savings due to elimination of the surcharge on rates on smaller vessels in the year 1955 would be \$1,720,000 for either the 30- or 35-foot channel and that the savings accruing from the 35-foot channel would be \$160,000 from the elimination of lost time waiting for tide. This last saving would result from commerce destined both to Weymouth Fore and Town Rivers.

30. The institute contends that the direct and indirect benefits which will result from the improvement of Weymouth Fore River Channel are about equal. The direct benefits claimed are savings due to reduction in delays to ships and reduction in surcharge rates through use of larger vessels. The indirect benefits are made up of items which are intangible and which cannot be exactly or readily calculated. They would consist of the development of the waterfront area adjacent to the improvement, more utilization of the larger and more economical ships constructed by the United States Government during the war, and encouragement of larger and more economical distribution of petroleum products to consumers in the area south of Boston.

31. He recommended that the Weymouth Fore River Channel be deepened to 35 feet for a width of 400 feet extending from Nantasket Gut to the terminals near the head of navigation.

32. A representative of the Sprague Steamship Co., which carries coal to the power plant located on the river, stated that the vessels that the company operates today are unable to navigate the waterway except on high water and during daylight hours.

33. The representative of the Cities Service Oil Co. spoke of the 75 T-2 tankers brought to its refinery during the year and to the conditions under which operations are now carried on. He asserted that the trend of the industry is expected to increase the number of tanker arrivals yearly.

COMMERCE

34. The following tables give a comparative statement of traffic, in tons of 2,000 pounds, using Weymouth Fore River and the freight traffic which constituted the commerce of 1948.

Comparative statement of traffic

Year	Commerce for Weymouth Fore River	Commerce for Weymouth Back River and Town River	Year	Commerce for Weymouth Fore River	Commerce for Weymouth Back River and Town River
1939.....	1,703,567	420,144	1944.....	1,700,538	342,964
1940.....	2,119,944	521,891	1945.....	1,812,392	311,433
1941.....	1,496,311	440,377	1946.....	1,157,494	332,279
1942.....	1,031,191	707,335	1947.....	1,696,891	684,894
1943.....	1,125,051	261,298	1948.....	1,813,154	657,376

Commerce in 1948, by commodities

FOREIGN		Tons
Imports:		
Crude petroleum.....		173,677
Inedible vegetable oils.....		10,855
Petroleum products.....		48,402
Total.....		232,934
DOMESTIC		Tons
Coastwise receipts:		
Bituminous coal.....		612,342
Coconut oil.....		5,564
Petroleum products.....		608,987
Total.....		1,226,891
Coastwise shipments: Petroleum products.....		71,506
Intraport receipts:		
Petroleum products.....		22,859
All other.....		17
Total.....		22,876
Intraport shipments:		
Petroleum products.....		258,809
All other.....		138
Total.....		258,947
Total traffic for Weymouth Fore River.....		1,813,154
Total traffic for Town River.....		517,452
Total traffic for Weymouth Back River.....		139,924
Grand total, all traffic.....		2,470,530

It will be noted that commerce for Weymouth Back River and Town River, under the heading "Comparative Statement of Traffic," shows an abrupt change in the year 1942. This variation was due to shipments of 354,799 tons of sand and gravel from Weymouth Back River for defense construction. In the year 1941 no shipment of sand and gravel was made, and in the year 1943 a shipment of 10,500 tons was made.

VESSEL TRAFFIC

35. The following tables show the vessel traffic on Weymouth Fore River in 1948, including traffic destined to or originating from Town River and Weymouth Back River.

Trips and drafts of vessels

UP-BOUND

Draft (feet)	Steamers	Motor vessels	Barges	Total
31	5			5
30	36	6		42
29	18			18
28	38			38
27	17			17
26	1			1
25	1		2	3
24	2			2
23	2	1	1	4
22	4	1		5
21	1	1		2
20	1		1	2
19	1		1	2
15	8	2	2	12
14		1		1
13	2	8		10
12	3	27	17	47
11		19	6	25
10 and under	61	1,087	1,650	2,798
Total	201	1,153	1,680	3,034
Total net registered tonnage	672,609	234,809	535,125	1,442,543

DOWN-BOUND

29	1			1
28		1		1
24	1	1		2
23	3			3
22	2			2
21	1	1		2
20	32	4		36
19	10	1		11
18	33			33
17	43			43
16	5	1		6
15	5	9	8	22
14	3	24	6	33
13		27	7	34
12		85	33	118
11		29	34	63
10 and under	62	970	1,592	2,624
Total	201	1,153	1,680	3,034
Total net registered tonnage	672,609	234,809	535,125	1,442,543

DIFFICULTIES ATTENDING NAVIGATION

36. The difficulties that are encountered in navigating the waterway are due to the lack of sufficient depth of water to allow vessels having a draft in excess of 28 feet to operate without undue delay, and to the narrow and crooked channel which results in occasional groundings of large seagoing vessels. It is claimed that it is impossible to negotiate the channel with the class of ships now employed in transporting the commodities to the industries located on the river, except at high tide and in daylight hours. The increased width and length of newly designed tankers and of naval vessels of the carrier class, some of which have a beam in excess of 100 feet, will add to the hazards of operating in the present channel. Several groundings have resulted in the last year, two of these were loaded tankers and their groundings are blamed on improper navigational aids. The other groundings were colliers, and the sharp turns and narrow channel are given as the

reason for these ships getting out of the improved channel. It is hazardous for two seagoing vessels to pass each other, as the currents and winds are often such as to cause one of the vessels to move in an oblique manner.

WATER POWER AND OTHER SPECIAL SUBJECTS

37. There are no questions of water power, flood control, wildlife conservation, or similar subjects involved in this study. The navigation improvements considered herein will have no effect on pollution.

PLANS OF IMPROVEMENT

38. Consideration has been given to the plan of improvement desired by the proponents of the work; that is, a channel generally 400 feet wide and 35 feet deep from Nantasket Gut to the Cities Service Oil Co.'s plant, with a maneuvering basin above the Fore River Bridge. In order to provide suitable entrance to this channel, the plan for the proposed improvement has been extended through Nantasket Roads to the 35-foot contour in Massachusetts Bay. This desired plan of improvement would provide—

A channel 500 feet wide and 35 feet deep at mean low water, extending from that depth in Massachusetts Bay, in the southerly half of the Narrows Channel in Nantasket Roads of the Boston Harbor project, continuing just north of Hunt Ledge and turning so as to pass through Nantasket Gut with the same width; thence with a width of 400 feet following the general alignment of the channel of the existing 27-foot project through Hingham Bay and Weymouth Fore River to the Fore River Highway Bridge; thence widening to form a 35-foot maneuvering basin of the same general area as the maneuvering basin of the existing 27-foot project.

This plan would meet the desires of shipping interests in that the channel would be widened and deepened, and the most serious turns eliminated. It would involve the removal of large quantities of ledge rock at several locations in the project.

39. An alternative plan providing for a somewhat less extensive improvement has also been considered. This plan of improvement would provide—

A channel and maneuvering basin 30 feet deep at mean low water, of the same widths and in the same location as the 35-foot-deep project described above.

This plan would also meet the desires of shipping interests to the extent of providing a wider and straighter channel, but the depth would be such that the larger vessels still could not navigate except at the higher tide stages.

40. A second alternative plan providing a depth of 32 feet has also been considered. This plan of improvement would provide—

A channel following the same route as the 35-foot deep project described above but having a depth of 32 feet at mean low water. The channel would be of the same width as that in the 35-foot deep project, but the maneuvering basin would be reduced in width to widths varying from 470 to 650 feet

This plan would also partially meet the desires of shipping interests but slight delays would still be incurred by the larger ships that might have occasion to use the waterway.

41. Three other alternative plans providing depths of 30, 32, and 35 feet at mean low water, but with widths less than that of the

desired 35-foot plan have also been considered. These plans of improvement would provide—

Channels following the same route as that in the desired plan, but having widths of 500 feet from deep water in Massachusetts Bay through Nantasket Gut, thence with a general width of 300 feet to Weymouth Fore River Bridge, with the maneuvering basin above the bridge 470 to 650 feet in width.

The 35-foot depth would provide the depth desired but the width of the channel would be the same as for the existing project except above Fore River Bridge.

42. Under each of the above plans, the 29-foot deep shoal spot just outside Nantasket Gut would be removed to project depth and the channel through the draw span of the Fore River Bridge would be reduced to 150 feet in width.

AIDS TO NAVIGATION

43. The United States Coast Guard has been consulted in regard to establishing aids to navigation and has submitted estimates totaling \$218,860 for fixed and floating aids with \$2,952 annually for maintenance.

SHORE-LINE CHANGES

44. As dredging has been accomplished in the river in the past with no resultant change in the shore line, it is concluded that the improvements considered herein will have no appreciable effect thereon. It is considered that dredging a channel through Nantasket Gut will have no effect on the adjacent headlands due to the rocky nature on the Hull side and to heavy gravel on the Peddocks Island side.

ESTIMATES OF FIRST COST

45. Estimates of cost have been prepared for the six plans of improvement. Included in the estimate of each project is the cost of the incomplete part of the 27-foot project. A separate estimate is given for the cost of the completed part of the 27-foot project based on present-day prices. Dredging quantities are in terms of place measurement and provide for dredging to the indicated depth in ordinary material and to 2 feet below the indicated depth in ledge, plus an allowance of 2 feet of overdepth in each case. Side-slopes of 1 on 3 in ordinary material and 1 on 1 in ledge were used in the estimates. Experience has indicated that ledge first appears in the channel excavation in this area in the form of irregular peaks which are difficult to locate through probings or borings. To cover the contingency of such hidden ledge-rock, the unit price used for ordinary material is about 33 percent greater than would be normally used for the work. The unit prices are based on the work being done by contract, and the disposal of all excavated material at sea. The cost estimate of relocating the cables of the Coast Guard and the Army in the vicinity of Nantasket Gut is based on the work being done by a cable boat. The estimated costs of altering other obstructing structures were furnished by the owners. The cost of providing aids to navigation was furnished by the Coast Guard. All cost estimates are based on price levels prevailing in November 1949. These estimates of cost for the various plans are given in the following table:

Estimated first costs

	Estimated quantities and costs for construction to general depth and width indicated													
	General width 300 feet								General width 400 feet					
	27-foot depth with maneuvering basin 470 to 900 feet wide		30-foot depth with maneuvering basin 470 to 650 feet wide		32-foot depth with maneuvering basin 470 to 650 feet wide		35-foot depth with maneuvering basin 470 to 650 feet wide		30-foot depth with maneuvering basin 470 to 900 feet wide		32-foot depth with maneuvering basin 470 to 650 feet wide		35-foot depth with maneuvering basin 470 to 900 feet wide	
	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost	Quantity (cubic yards)	Cost
Completed part of 27-foot channel through West Gut.....		\$754,000												
Completion of existing 27-foot project through Hull Gut:														
Dredging ordinary material at \$1 per cubic yard.....	247,000	247,000												
Dredging ledge rock at \$100 per cubic yard.....	350	35,000												
Completion of existing 27-foot project south of bridge: Dredging ordinary material at \$1 per cubic yard.....	167,345	167,345												
Construction of improvement from present condition:														
Dredging ordinary material at \$1 per cubic yard.....			1,635,900	\$1,635,900	2,520,800	\$2,520,800	3,848,000	\$3,848,000	2,344,500	\$2,344,500	3,155,000	\$3,155,000	5,253,500	\$5,253,500
Dredging ledge rock at \$25 per cubic yard.....			84,500	2,112,500	135,800	3,395,000	212,700	5,317,500	85,100	2,127,500	135,800	3,395,000	220,700	5,517,500
Completion of authorized 27-foot maneuvering basin outside of limits of considered improvement: Dredging ordinary material at \$1 per cubic yard.....	0	0	59,000	59,000	59,000	59,000	59,000	59,000	0	0	59,000	59,000	0	0
Altering cables (Corps of Engineers).....		6,000		60,000		60,000		60,000		60,000		60,000		60,000
Providing navigation aids (Coast Guard).....		218,900		218,900		218,900		218,900		218,900		218,900		218,900
Altering utilities (local interests).....		0		50,680		127,680		235,680		50,680		127,680		235,680
Total Corps of Engineers cost.....		1,209,345		13,867,400		16,034,800		19,284,500		4,532,000		16,669,000		10,831,000
Total Coast Guard cost.....		218,900		218,900		218,900		218,900		218,900		218,900		218,900
Total Federal cost.....		1,428,245		14,086,300		16,253,700		19,503,400		4,750,900		16,887,900		11,049,900
Total non-Federal cost.....		0		50,680		127,680		235,680		50,680		127,680		235,680
Total cost.....		1,428,245		14,136,980		16,381,380		19,739,080		4,801,580		17,015,580		11,285,580

¹ Includes \$59,000 for completion of authorized 27-foot maneuvering basin outside of limits of considered improvement.

46. It is considered that no alterations to the Fore River Bridge will be required as the narrowing of the channel to 150 feet through the draw passage will provide ample cover in the side slopes for the timber-pile foundation of the bridge piers.

ESTIMATES OF ANNUAL CHARGES

47. The estimated annual carrying charges have been computed on an assumed life of 50 years for that part of the improvement pertaining to channel excavation, and 40 years for the altering of submarine cables and other structures, and on the assumption that all work would be carried on at Federal expense except the altering of the sewer syphon, telephone cables, and bridge cables which it is assumed would be done by local interests. For the Federal part of the investment an interest rate of 3 percent was used, and for non-Federal investment 3.5 percent. The amount of the Federal investment includes the cost of the completed 27-foot channel. The carrying charges reflect this cost so that a comparison may be made with the condition that was obtained when the 24-foot channel existed. Maintenance includes the cost of maintaining the channel and navigation aids. Although construction of the improvements will require more than 1 year, interest during construction has been omitted from the estimate, since benefits will accrue as the work proceeds. The estimated annual charges are indicated in the following table:

Estimated annual charges

	General width 300 feet					General width 400 feet		
	Completed 27-foot project West Gut to Fore River Bridge (current prices)	27-foot project Nantasket Gut to Cities Service terminal with maneuvering basin 470 to 900 feet wide	30-foot project with maneuvering basin 470 to 650 feet wide ¹	32-foot project with maneuvering basin 470 to 650 feet wide ¹	35-foot project with maneuvering basin 470 to 650 feet wide ¹	30-foot project with maneuvering basin 470 to 900 feet wide	32-foot project with maneuvering basin 470 to 650 feet wide ¹	35-foot project with maneuvering basin 470 to 900 feet wide
Federal investment:								
Construction cost (Corps of Engineers)	\$754,000	\$1,209,345	\$4,621,400	\$6,788,800	\$10,038,500	\$5,286,000	\$7,423,000	\$11,585,000
Aids to navigation (Coast Guard)		218,900	218,900	218,900	218,900	218,900	218,900	218,900
Total Federal investment	754,000	1,428,245	4,840,300	7,007,700	10,257,400	5,504,900	7,641,900	11,803,900
Non-Federal investment: Construction cost			50,680	127,680	235,680	50,680	127,680	235,680
Total non-Federal investment			50,680	127,680	235,680	50,680	127,680	235,680
Federal annual carrying charge:								
Interest on investment	22,620	42,847	145,209	210,231	307,722	165,147	229,257	354,117
Amortization of investment	6,690	12,654	42,885	62,088	90,880	48,773	67,707	104,582
Maintenance, completed 27-foot project	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Maintenance, incompleted 27-foot project		7,000	7,000	7,000	7,000	7,000	7,000	7,000
Maintenance, considered improvement			500	500	500	1,000	1,000	1,000
Total Federal annual carrying charge	36,810	70,001	203,094	287,319	413,602	229,420	312,464	474,199
Non-Federal annual carrying charge:								
Interest on investment			1,774	4,469	8,249	1,774	4,469	8,249
Amortization of investment			600	1,510	2,788	600	1,510	2,788
Total non-Federal carrying charge			2,374	5,979	11,037	2,374	5,979	11,037
Total annual carrying charge:								
Federal	36,810	70,001	203,094	287,319	413,602	229,420	312,464	474,199
Non-Federal			2,374	5,979	11,037	2,374	5,979	11,037
Total annual carrying charges	36,810	70,001	205,468	293,298	424,639	231,794	318,443	485,236

¹ Including costs for the incompleted part of authorized 27-foot maneuvering basin outside of the limits of the considered improvement.

ESTIMATES OF BENEFITS

48. The improvement of Weymouth Fore River for deep-water navigation will result in savings in the cost of operating deep-draft vessels now using the river, in savings in the cost of delivering commodities to terminals in Weymouth Fore River, and in the elimination of vessel damage. These savings will be realized on the commerce carried in deep-draft vessels. The amount of the savings will depend upon the depth of the channel, the vessels involved, and the methods of handling their cargoes. The improvement of the channel on the east side of Peddocks Island will result in a saving of about one-half hour in the time required to transit the river by most cargo vessels and tugs, and by large vessels moving to and from the shipyard. The industries on Weymouth Fore River which utilize deep-draft vessels are the Cities Service Oil Co. oil plant, the C. H. Sprague & Son Co. coal yard at the plant of the Boston Edison Co., the Procter & Gamble Manufacturing Co. soap plant, and Bethlehem Steel Co. (shipbuilding division). The Socony-Vacuum Oil Co. oil plant on Town River, which also utilizes deep-draft vessels, has its wharf located on the edge of the Weymouth Fore River project and can utilize improvements of the latter river with a small amount of additional dredging without the improvement of Town River as a whole. For this reason, it is concluded that 75 percent of possible benefits accruing from deep-water commerce destined to the Socony-Vacuum Oil Co. is assignable to Weymouth Fore River. The only other industry on Town River which utilizes deep-draft vessels is the Quincy Oil Co., but this company is located at such a distance from Weymouth Fore River that benefits to be derived by commerce destined to the plant are generally not assignable to Weymouth Fore River. However, vessels destined to the plant which now must await daylight before entering Weymouth Fore River will be able to navigate that river during the 1.5-hour period before daylight to reach Town River at daylight and a benefit will thus accrue from the improvement of Weymouth Fore River.

49. Savings in the operation of vessels destined to all terminals will result principally from the reduction and elimination of delays in waiting for high water and daylight and the reduction in the number of tugs required to handle the vessels. Transportation savings will also accrue through the use of the new type supertankers which could not operate on a 24-foot channel. Savings in the cost of delivering commodities will also result from the elimination of lightering of large oil tankers destined for the Cities Service Oil Co., and the elimination of added rail shipment charges on cargoes for the Procter & Gamble Manufacturing Co. The cargoes delivered to the latter company are received from the west coast, the Far East, and the Dutch East Indies. The added rail-shipment charges are presently incurred through the refusal of steamship lines in this commerce to navigate Weymouth Fore River about 50 percent of the time, thus necessitating delivery to Boston and reshipment by rail to Quincy.

50. Other benefits to be derived from the improvement are the elimination of hazardous navigation conditions which have resulted in several serious groundings of vessels and incurred large monetary losses on vessel repairs and time loss.

51. The Bethlehem Steel Co. shipyard is one of the country's major shipyards and builds and repairs all classes of commercial and naval

vessels. The only benefits that could accrue to the shipbuilding activities would be those which would result from the company being able, as a result of a deeper channel, to deliver the completed vessels to their owners at dates earlier than would be possible with the channel in its present condition. Only a few vessels constructed annually by the shipyard have a loaded draft in excess of 27 feet. When these vessels leave the yard, either for trial runs or delivery to their owners, they can be operated without cargo and, therefore, draw less water than the 27-foot channel provides. Therefore, the present channel condition is not a delaying factor to the delivery of completed or repaired commercial vessels, and hence, no benefits can be derived from the proposed channel improvements. The Commandant of the First Naval District has advised that the deepening of the channel to the shipyard to meet the needs of the Navy is not warranted at this time. Therefore, it is considered that no benefit would accrue to naval uses of the waterway over and beyond the unevaluated benefit claimed for the 27-foot maneuvering basin described in House Document No. 291, Seventy-seventh Congress, first session. As no evidence has been submitted indicating that there has been any change in this unevaluated benefit, it has been retained as part of the benefit that would accrue from the 27-foot depth improvement.

52. As a basis for comparison, it has been assumed that the channel condition is the same as it was prior to any work having been undertaken on the 27-foot improvement; that is, a channel 24 feet deep and 300 feet wide by the way of West Gut. Benefits have been estimated on the volume of commerce that is expected in 1955 and the average annual volume during the life of the project. The amount of commerce in 1955 was determined from estimates furnished by industries concerned which are considered reasonable. The average annual volume of commerce was determined from data obtained from various sources and took into consideration the several factors that might influence the final results, such as plant expansion, consumer trends in the commodities usually transported on the waterway, population increase, and the displacement of other types of fuel by the introduction of natural gas as a fuel. A detailed discussion and evaluation of transportation costs on the 24, 27, 30, 32, and 35-foot channels are given in the appendix.¹ The savings for the channels of the depths indicated, as compared with the 24-foot channel through West Gut, are given in the following table. The 1955 data are given as an indication of what might be expected about the time the project is completed, and the average annual data to show what might be expected over a long period of years.

Annual evaluated savings for channels of indicated depths compared with a 24-foot channel through West Gut for all commerce

Channel depth and location	Total annual savings in year 1955		Total average annual savings during life of project	
	Petroleum carried in T-2 and T-3 tankers	Petroleum carried in T-2, T-3, and 28,000-ton tankers	Petroleum carried in T-2 and T-3 tankers	Petroleum carried in T-2, T-3, and 28,000-ton tankers
27 feet, West Gut.....	\$641,700	\$817,565	\$868,750	\$1,297,615
27 feet, Nantasket Gut.....	837,503	1,003,618	1,127,548	1,534,113
30 feet, Nantasket Gut.....	898,449	1,209,964	1,206,204	1,903,229
32 feet, Nantasket Gut.....	914,425	1,225,516	1,228,000	1,923,907
35 feet, Nantasket Gut.....	914,425	1,231,565	1,228,000	1,936,015

¹ Not printed.

COMPARISON OF BENEFITS AND COSTS

53. The annual benefits estimated for 1955 and for the average during the life of the project have been compared with the annual costs for the various plans of improvement. Comparisons have been made to show both the value of the considered plans over the 24-foot-depth project and over the present condition. The comparisons are given in the following tables:

Comparison of benefits and costs

CHANNELS OF INDICATED DEPTHS OVER 24-FOOT CHANNEL

Channel depth and location	Annual benefits	Annual costs, 300-foot width	Ratio of benefits to costs	Annual costs, 400-foot width	Ratio of benefits to costs
Year 1955—Petroleum carried in T-2 and T-3 tankers only:					
27 feet—West Gut.....	\$641,700	¹ \$44,313	14.5	-----	-----
27 feet—Nantasket Gut.....	837,503	70,001	12.0	-----	-----
30 feet—Nantasket Gut.....	898,449	205,468	4.4	\$231,794	3.9
32 feet—Nantasket Gut.....	914,425	293,298	3.1	318,443	2.9
35 feet—Nantasket Gut.....	914,425	424,639	2.2	485,236	1.9
Year 1955—Petroleum carried in T-2, T-3, and 28,000-ton tankers:					
27 feet—West Gut.....	817,565	¹ 44,313	18.4	-----	-----
27 feet—Nantasket Gut.....	1,003,618	70,001	14.3	-----	-----
30 feet—Nantasket Gut.....	1,209,904	205,468	5.9	231,794	5.2
32 feet—Nantasket Gut.....	1,225,516	293,298	4.2	318,443	3.8
35 feet—Nantasket Gut.....	1,231,565	424,639	2.9	485,236	2.5
Average during life of improvement—petroleum carried in T-2 and T-3 tankers only:					
27 feet—West Gut.....	868,750	¹ 44,313	19.6	-----	-----
27 feet—Nantasket Gut.....	1,127,548	70,001	16.1	-----	-----
30 feet—Nantasket Gut.....	1,206,204	205,468	5.9	231,794	5.2
32 feet—Nantasket Gut.....	1,228,000	293,298	4.2	318,443	3.9
35 feet—Nantasket Gut.....	1,228,000	424,639	2.9	485,236	2.5
Average during life of improvement—petroleum carried in T-2, T-3, and 28,000-ton tankers:					
27 feet—West Gut.....	1,297,615	¹ 44,313	29.3	-----	-----
27 feet—Nantasket Gut.....	1,534,113	70,001	21.9	-----	-----
30 feet—Nantasket Gut.....	1,903,229	205,468	9.3	231,794	8.2
32 feet—Nantasket Gut.....	1,923,907	293,298	6.6	318,443	6.0
35 feet—Nantasket Gut.....	1,936,015	424,639	4.6	485,236	4.0

CHANNELS OF INDICATED DEPTHS OVER EXISTING CONDITIONS

Year 1955—Petroleum carried in T-2 and T-3 tankers only:					
27 feet—Nantasket Gut.....	\$195,803	\$33,191	5.9	-----	-----
30 feet—Nantasket Gut.....	256,749	168,658	1.5	\$194,984	1.3
32 feet—Nantasket Gut.....	272,725	256,488	1.1	281,633	1.0
35 feet—Nantasket Gut.....	272,725	387,829	.7	448,426	.6
Year 1955—Petroleum carried in T-2, T-3, and 28,000-ton tankers:					
27 feet—Nantasket Gut.....	186,053	33,191	5.6	-----	-----
30 feet—Nantasket Gut.....	392,399	168,658	2.3	194,984	2.0
32 feet—Nantasket Gut.....	407,951	256,488	1.6	281,633	1.4
35 feet—Nantasket Gut.....	414,000	387,829	1.1	448,426	.9
Average during life of improvement—Petroleum carried in T-2 and T-3 tankers only:					
27 feet—Nantasket Gut.....	258,798	33,191	7.8	-----	-----
30 feet—Nantasket Gut.....	337,454	168,658	2.0	194,984	1.7
32 feet—Nantasket Gut.....	359,250	256,488	1.4	281,633	1.3
35 feet—Nantasket Gut.....	359,250	387,829	.9	448,426	.8
Average during life of improvement—Petroleum carried in T-2, T-3, and 28,000-ton tankers:					
27 feet—Nantasket Gut.....	236,498	33,191	7.1	-----	-----
30 feet—Nantasket Gut.....	605,614	168,658	3.6	194,984	3.1
32 feet—Nantasket Gut.....	626,292	256,488	2.4	281,633	2.2
35 feet—Nantasket Gut.....	638,400	387,829	1.6	448,426	1.4

¹ Includes annual cost of \$36,810 for that part of the 27-foot project already completed, and \$7,503 for that part of the 27-foot project south of the Fore River Bridge which is incomplete.

PROPOSED LOCAL COOPERATION

54. No local cash contribution toward the cost of improvement should be required as the benefits to be derived are considered to be general in character. However, the cost of altering the submarine cable crossings, the sewer line, the bridge or other obstructive structures not owned by the United States, should be borne by local interests. Local interests should also be required to hold and save the United States free from claims for damages due to the construction and the improvement.

COORDINATION WITH OTHER AGENCIES

55. All Federal, State, and local agencies, interested in the development and use of waterways in general, and in the subject waterway in particular, were notified of the public hearing held June 27, 1947, on the desired improvement. All agencies that expressed interest in the waterway were in favor of the desired plan of improvement. Subsequent to the development of the plan of improvement proposed herein, local interests have been consulted and have expressed a general agreement with the plan. The Port of Boston Authority, which is the State agency that is responsible for the development of Boston Harbor, has stated that it will furnish the required assurances of local cooperation.

DISCUSSION

56. Weymouth Fore River is one of the most important waterways contributing to the commerce of the port of Boston. The river was first improved by the Federal Government for deep-draft navigation in 1905 when a depth of 18 feet was provided in the channel from Hingham Bay to Weymouth Fore River Bridge. Later, it was deepened to 24 feet and finally to 27 feet under the existing project. As a result of these improvements, the commerce has grown from about 130,000 tons in 1920 to more than 2,400,000 tons in 1948. This tonnage consists principally of coal and petroleum products.

57. At the present time deep-draft vessels approach Nantasket Roads by one of two routes—from the open sea directly into the Roads, and through the Narrows Channel, from President Roads in Boston Harbor. From Nantasket Roads these vessels pass through the deep water westerly of Peddocks Island and then through West Gut into Weymouth Fore River. The route involves sharp turns near West Gut. Another route from Nantasket Roads used by lighter-draft vessels passes through Nantasket Gut where there are tidal currents up to three knots, thence across Hingham Bay and into Weymouth Fore River. At a point in the deep water westerly of Sheep Island the routes merge.

58. Located on or near the shores of Weymouth Fore River are large industrial plants devoted to shipbuilding, development of electrical energy, distribution of coal and petroleum products, manufacture of soap and soap products, and similar activities. The four big industries on the river are the Boston Edison Co., Procter & Gamble Manufacturing Co., Bethlehem Steel Co. (shipbuilding division), and the Cities Service Oil Co. With the exception of the Bethlehem Steel Co., these plants utilize water transportation in excess of the

full capacity of the present channel. These plants have space expansion possibilities and in most instances, enlargement of existing facilities are generally in advance of the river improvement. Docking facilities and storage capacities have been rebuilt and increased, and provide for more flexibility in handling cargoes. These industries serve residents, manufacturing establishments, and general business. Industrial concerns are aware of the potentialities of the territory which is located within an area of dense population.

59. The types of ships now used in transporting the commodities to the industrial establishments on the river are large colliers of the "seam" class, and tankers, generally comparable to the T-2 class. These ships draw about 30 feet when loaded. Tankers slightly smaller than the T-2 class are used in bringing oil into the Town River Channel. Due to the economies realized by ships of greater burden than the T-2 class, the type of ship to be used is foreseen as one having slightly greater draft than those presently used. It is expected that keener competition in the fuel industry will hasten the construction of the latter type and will probably force an early obsolescence of the smaller tankers and possibly many of the T-2 class.

60. As developed in previous studies and reinforced by further facts obtained by conferences and public hearings, the route preferred from Nantasket Roads by navigation interests is through Nantasket Gut. In selecting the channel locus, consideration has been given to the following points and the route selected is the result of carefully assessing them.

(a) The route through Nantasket Gut is shorter than that to the west of Peddocks Island, which results in a saving in time and thus a financial benefit to the vessels using this channel.

(b) The route through Nantasket Gut is considered less difficult to navigate than that west of Peddocks Island because of its better alinement, because dense fogs are not so frequent, and because ice conditions are claimed to be better in severe winters.

61. The approach to Nantasket Roads direct from the open sea, passing south of Boston Light, is considerably shorter than the route through Broad Sound to President Roads and thence through the Narrows Channel. However, the route by Boston Light is subject to heavy seas in times of easterly storms, with the result that ships that could navigate in quiet waters, might strike bottom. Thus, there would be times when vessels could not use this entrance, but the number of trips that vessels could not navigate this reach is considered to be small.

62. The benefits that would be realized from improvement of the Weymouth Fore River for navigation over and beyond the authorized 27-foot project are those which would accrue through the use of large seagoing vessels. These would be derived from reducing delays due to tidal fluctuations, the savings due to elimination of lightering.

63. Six plans of improvement have been considered in this report in addition to the 27-foot improvement which is partially complete. These plans are for projects having depths of 30, 32, and 35 feet with general widths of 300 feet and 400 feet for each depth. As an indication of what might be expected at about the time the project is completed, benefits have been estimated on the basis of commerce that is anticipated will be carried in deep-draft vessels in the year 1955. This volume of commerce amounts to 2,166,600 tons, and has been

determined from the requirements of the companies served as furnished by the respective companies. The estimates furnished appear to be reasonable in light of the increased use of petroleum as a heating and motor fuel. Benefits have also been estimated on the basis of the anticipated average annual commerce carried by deep-draft vessels amounting to 3,017,000 tons. Benefits computed from the latter estimate are considered to represent more closely the value of the improvement than those based on anticipated commerce in year 1955.

64. Under the plans for a depth of 32 feet, vessels drawing around 30 feet of water, that is, 10,000-ton colliers and T-2 tankers, could operate at all times. In such a channel larger vessels, for example 28,000-ton tankers, would at times be delayed by tidal conditions. Under the plans for a depth of 35 feet all vessels, which it is now contemplated would use the waterway, could navigate without reference to tidal conditions. The principal users of the waterway have been contacted with reference to the selection of the plan and their representatives have informally stated that they prefer the 35-foot improvement to the 32-foot improvement. With the contemplated increase in traffic some congestion might occur in the 300-foot wide channel, but it is believed that the condition would not be serious. Shipping interests have advised that the new supertankers can operate on the 300-foot width waterway without difficulty, but cannot pass other traffic.

65. The great economy of operating the tankers of the 26,000-ton to 28,000-ton classes indicates that provision should be made for this type vessel. Thus a channel depth of 35 feet should be provided to meet the requirements of the 32-foot and 33-foot drafts of these vessels.

66. Compared with the present condition, the benefit-cost ratio for the 35-foot improvement are 1.6 for the 300-foot width project and 1.4 for the 400-foot width project. Although on this basis a 400 foot wide improvement appears to be warranted, the actual number of vessel trips anticipated is such that the likelihood of vessels having to wait for each other to pass is remote. The added construction cost to provide a channel 400 feet wide in order to avoid this waiting is considered to be not warranted.

67. When the 27-foot project above Fore River Bridge was being considered the extremely wide area was proposed by the Department of the Navy for the launching of large naval ships. Authorization for the work was based on the needs of the shipbuilding industry. Using funds furnished by the Department of the Army enough of the work was accomplished during the recent war to meet the needs of the Navy at that time. The improvement of the area above Fore River Bridge to 35 feet with widths varying to 650 feet, as contemplated herein will not include all of the area of the presently authorized 27-foot project. Since the need for a change in the depth of the marginal areas of the project has not been shown, no modification of the 27-foot project outside the limits of the proposed 35-foot depth is contemplated. In the area outside of the 35-foot recommended improvement, it is estimated that 59,000 cubic yards of ordinary material will remain in the 27-foot authorized project above the bridge. At the unit price used in this report, it would require \$59,000 in additional funds to complete the 27-foot project in that area. The portion of the authorized 27-foot

project through Nantasket Gut and Hingham Bay is contained within the limits of the recommended improvement to 35 feet.

ALLOCATION OF COSTS

68. All costs of dredging, including removal of ledge, should be borne by the Corps of Engineers. As the Army and the Coast Guard might not have funds available when the cables owned by those agencies have to be moved, it is considered that these costs should also be borne by the Corps of Engineers. The cost of providing aids to navigation should be borne by the Coast Guard, and the cost of altering structures other than those of the Army and Coast Guard should be borne by local interests. In addition to the cost of the authorized project, these costs are estimated as follows:

	Initial cost in addition to existing project	Annual main- tenance in addition to existing project
Dredging, Corps of Engineers.....	\$8, 775, 200	\$500
Altering Army and Coast Guard cable, Corps of Engineers.....	54, 000	0
Aids to navigation.....	0	0
Total Federal cost.....	8, 829, 200	500
Altering other cables or structures.....	235, 680	0
Total non-Federal cost.....	235, 680	0
Total cost.....	9, 064, 880	500

CONCLUSIONS

69. Weymouth Fore River carries a substantial commerce in petroleum products and coal and is an important part of the port of Boston. As the commerce is large and is expected to increase, thereby encouraging the use of deeper-draft vessels, the improvement of the channel is warranted.

70. It is the opinion of the division engineer, that the improvement of the existing and authorized 27-foot channel to a depth of 35 feet at mean low water with a general width of 300 feet from the vicinity of Boston Light, through Nantasket Gut, to a point about 2,700 feet above the Fore River Bridge, is justified and that the improvement should be constructed at the expense of the United States. The benefit-cost ratio for the proposed improvement is 1.6. The total estimated cost of constructing the improvement from the present condition is \$9,680,080.

71. Local interests should make such alterations to submarine cables crossing the waterway and to other obstructing structures as are necessary at their own expense, and should relieve the United States from claims for damages that might arise from the construction of the improvement.

72. It is anticipated that construction of the improvement would take 5 years. If the project is authorized, funds for the Corps of Engineers work should be appropriated over a period of five fiscal years as follows:

First fiscal year	\$1, 900, 000
Second fiscal year	1, 500, 000
Third fiscal year	1, 700, 000
Fourth fiscal year	2, 500, 000
Fifth fiscal year	1, 625, 500
Total	9, 225, 500

These funds are for the construction from the present condition exclusive of \$59,000 required for completion of the 27-foot maneuvering basin outside the limits of the recommended improvement.

RECOMMENDATIONS

73. It is recommended that the existing project for Weymouth Fore River be modified to provide: A channel 35 feet deep at mean low water in ordinary material and 37 feet in rock, and 500 feet wide from deep water, along the southerly half of the Narrows Channel in Nantasket Roads of the Boston Harbor project, thence turning and passing through Nantasket Gut, thence with a general width of 300 feet across Hingham Bay and into Weymouth Fore River as far as Fore River Bridge, following the general alinement of the channel of the existing project, thence widening above the bridge to form a maneuvering basin 470 to 650 feet wide, generally as shown on the enclosed maps, all at an estimated cost of \$8,829,200 to the United States for construction. This esimated cost is that in excess of the amount required to complete the existing project. The cost of annual maintenance is estimated to be \$500 in addition to that now required to maintain the existing project. No modification is to be made in the Narrows Channel in Nantasket Roads of the existing Boston Harbor project, but all construction in that channel at depths greater than 27 feet below mean low water shall be included in the Weymouth Fore River project.

74. Modification is recommended subject to the condition that local interests hold and save the United States free from all damages due to the construction and the improvement.

G. W. CARLSON,
Lieutenant Colonel, Corps of Engineers,
Acting Division Engineer.

LIST OF ILLUSTRATIONS MADE IN CONNECTION WITH THE
REPORT OF THE DIVISION ENGINEER

(Only plate 1 printed)

Plate 1, sheet 1—General map.
 Plate 2, sheet 1—Detail plan.
 Plate 3, sheet 2—Detail plan.
 Plate 4, sheet 3—Detail plan.
 Plate 5, sheet 4—Detail plan.
 Plate 6, sheet 5—Detail plan.
 Plate 7, sheet 6—Detail plan.
 Plate 8, sheet 7—Detail plan.
 Plate 9, sheet 8—Detail plan.

